

Memorandum

To: Dave Coolidge
CC: Karen Halterman, Kamrul Choudhury (LM), Lun Xie (Swales)
From: Jack Hunter *JH*
Date: 2/1/2002
Subject: Temperature Oscillations of The SARR Transmitter, Filter & Receiver

Since NASA/LM can't trace the SARR anomaly to the antenna, the problem may be located inside the ESM. Therefore, the amplitude of the orbital temperature oscillations of the internal SARR components has become important to the anomaly investigation. The magnitude of these temperature oscillations will be used to evaluate the severity of the thermal fatigue stresses in components. Predicted and flight temperature oscillations of the SARR RF filter, transmitter & receiver have been summarized and the data is documented herein.

The amplitude of the S/C orbital temperature oscillations is a direct function of the shadow period length. The TIROS S/Cs will be subjected to a maximum shadow period if the sun angle gets to 80°. Since the ESM orbital temperatures for a sun angle of 80° were handy, the SARR component temperatures for 80° are plotted in Figure 1. Figure 2 shows the equipment layout of Panel #3 of the ESM, which is the location of the SARR filter and receiver.

The NOAA-16 flight temperatures of the SARR components are shown in Figures 3 & 4. The flight thermistor (NESM3T) is positioned adjacent to the RFF-4 filter; therefore its temperature is a good representative of the filter's temperature. Figure 4 shows the orbital temperature oscillation of the following items:

	Mnemonic	Item
Transmitter	NSARTXBT	Baseplate
	NSARTXAT	X-mitter A
	NSARTXB	X-mitter B
	NSARALOT	121/243 Oscillator-A
	NSARBLOT	121/243 Oscillator-B
Receiver	NSARPTCA	PTC-A
	NSARPTBT	PTC-B

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Given in the Tables below are summaries of orbital average temperatures and their amplitude of oscillation.

Predictions (Worst Case Oscillations)

Item	Orbital Temperatures (°C)
Receiver	19.60 ± 0.08
Transmitter	25.00 ± 0.13
Filter	18.30 ± 0.09

NOAA-16 Flight Data

Receiver	
PTC- A	11.20 ± 1.12
PTC- B	11.70 ± 1.33
Transmitter	
Baseplate	16.87 ± 2.17
X-mitter -A	24.21 ± 2.17
X-mitter -B	14.87 ± 2.17
121/243 Oscillator-A	12.54 ± 0.50
121/243 Oscillator-B	14.87 ± 0.50
Filter	13.23 ± 2.38

This investigation showed that the math model isn't very accurate in predicting the amplitude of components temperature orbital oscillations. The predicted amplitudes are an order of magnitude less than the flight data indicates.

The RF switch is located inside the transmitter; therefore the amplitude of the switch temperature oscillation is probable around $\pm 2.17^{\circ}\text{C}$. I don't believe that even the maximum flight data amplitude of $\pm 2.38^{\circ}\text{C}$ is severe enough to cause a thermal fatigue failure in any of the SARR equipment.

FIGURE - 1 COMPUTED ORBITAL TEMPERATURES OF SARR COMPONENTS

80 ° Sun angle, Hot Case

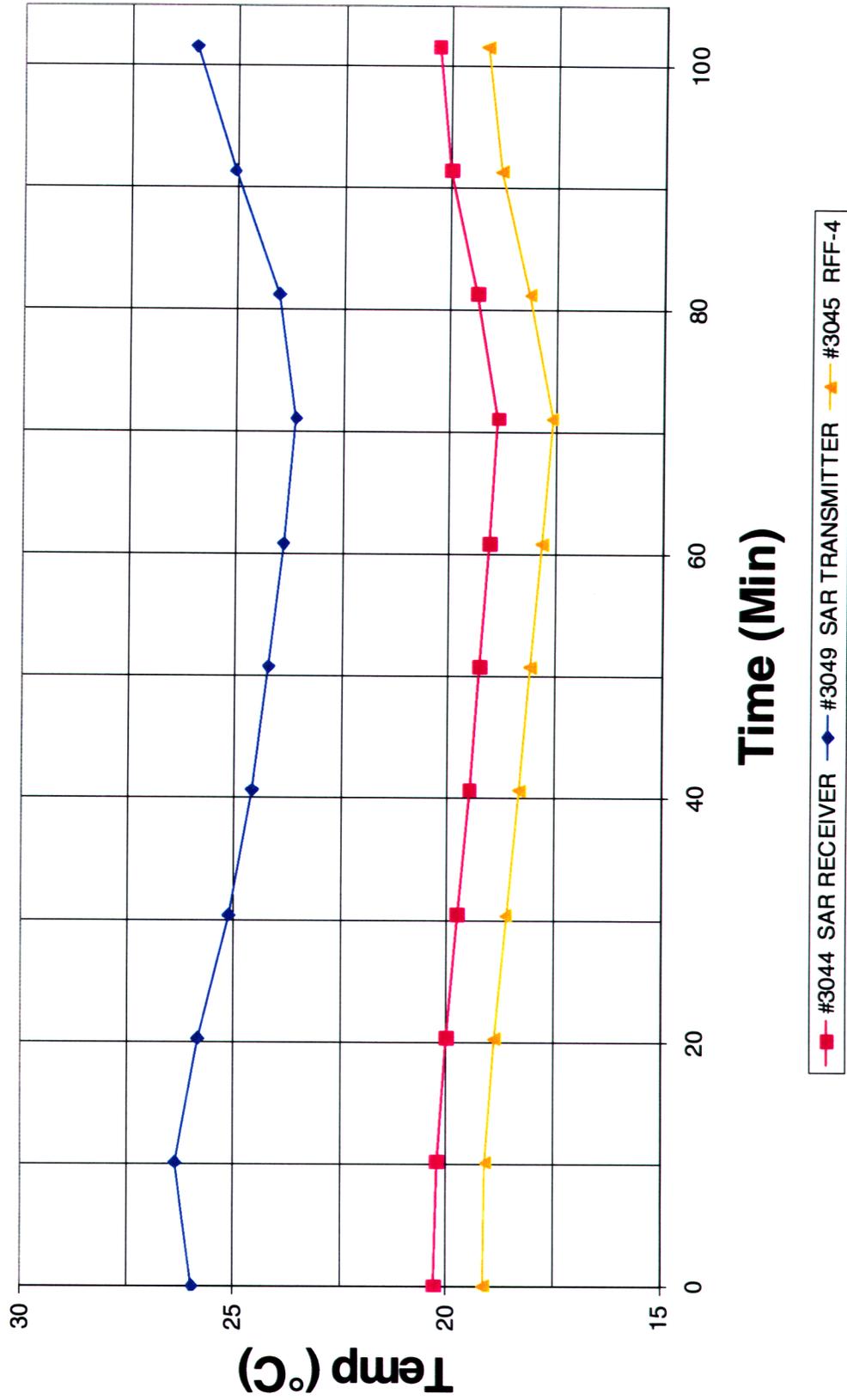
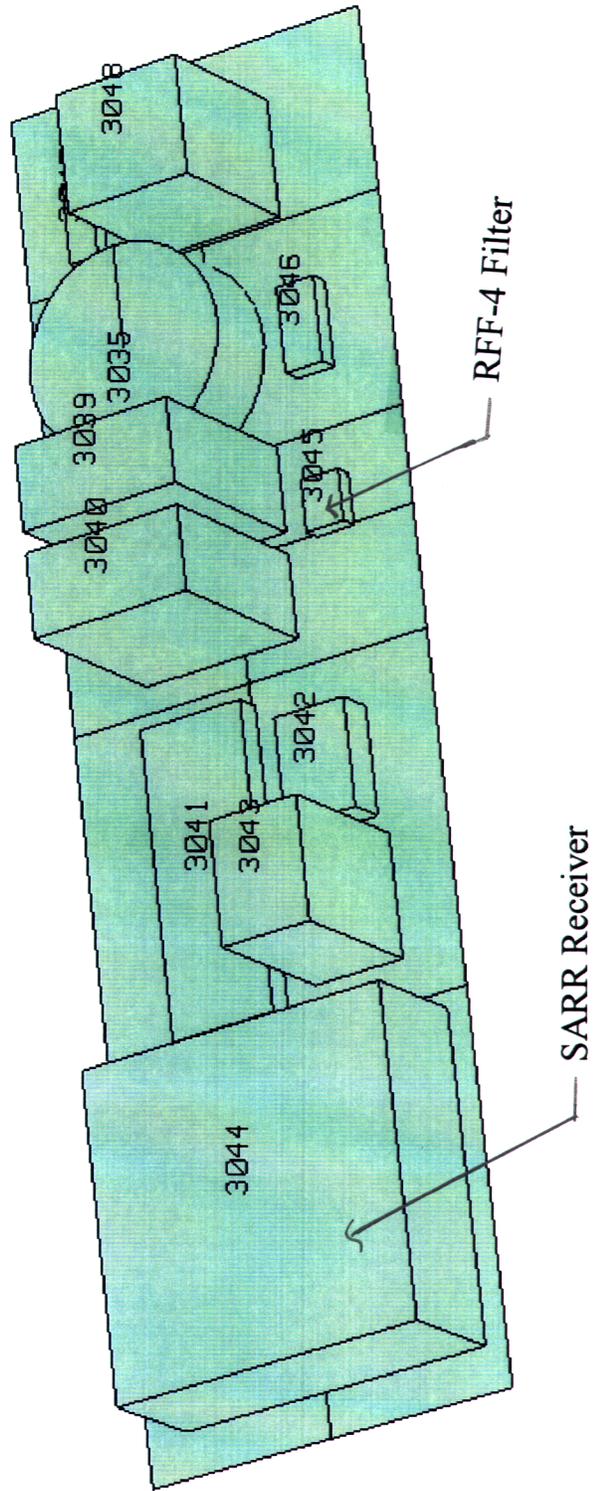
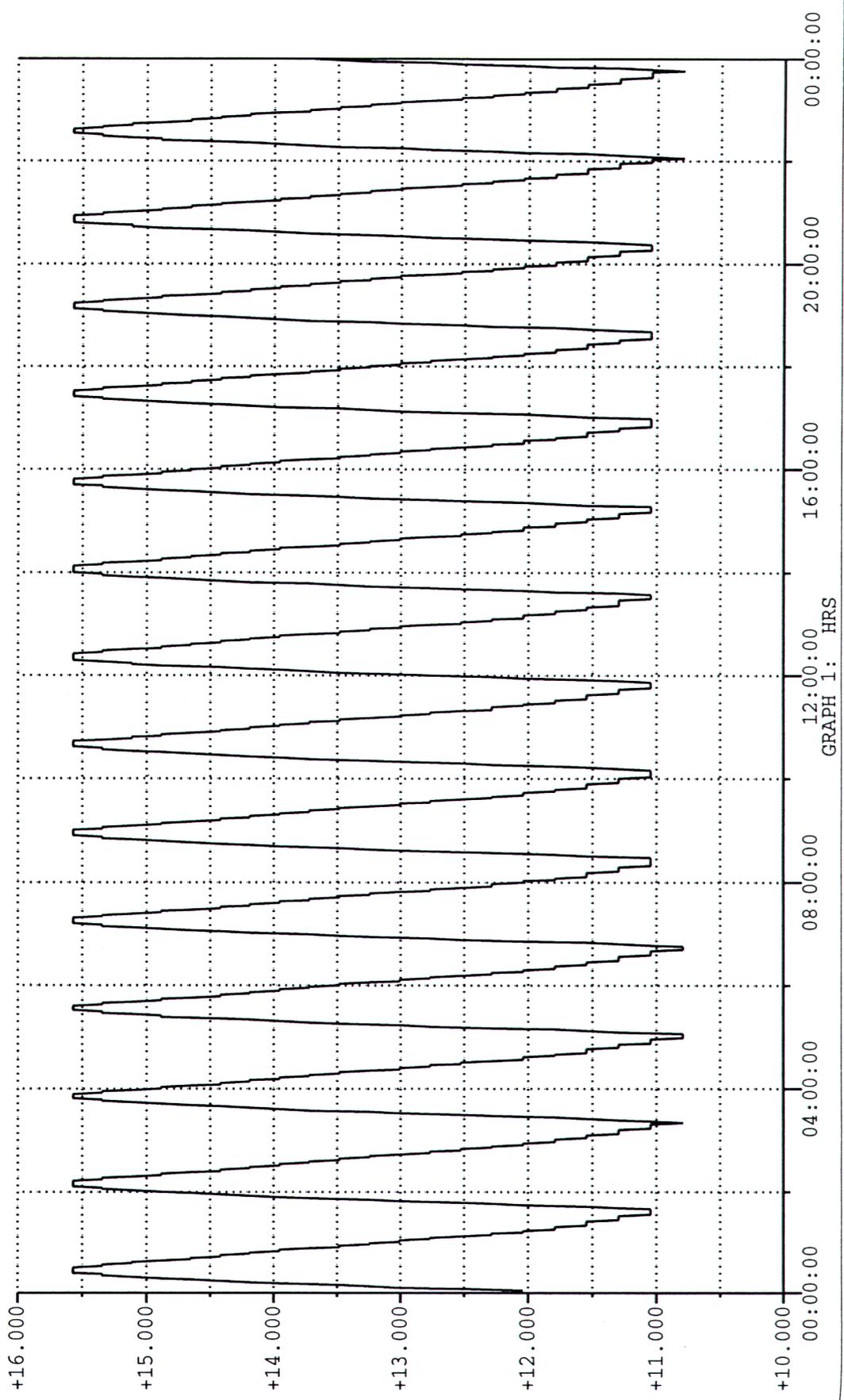


FIGURE - 2 COMPONENT LAYOUT OF PANEL 3



PLOT NAME: NRT_OPSSHISLOT_PLOT:0SAR
 TITLE: SRA STUDY
 DESCRIPTION: SRA STUDY
 SETUP FILENAME: NRT_OPSSHISLOT_SETUP:00SAR
 START/STOP TIME: 02/001/00:00:00.0 - 02/002/00:00:00.0
 Y-DATA CHAN UNITS TYPE VS X_DATA CHAN UNITS TYPE SYM GPH Y-DATA CHAN UNITS TYPE SYM GPH
 NESM3T FA377 DEG EU TIME HRS HRS
 SCID: 16
 PLOT CREATION DATE: 030/20:40:41
 PLOT PRINT DATE: 030/20:44:54
 SAMPLING PERIOD: 000/00:02:00.00

FIGURE - 3 FLIGHT TEMPERATURE OF THE SARR FILTER (RFF-4)



SCID: 16
 PLOT CREATION DATE: 029/14:57:14
 PLOT PRINT DATE: 029/14:58:42
 SAMPLING PERIOD: 000/00:10:00.00

PLOT NAME: NRT_OPSSHISPLOTT_PLOT:OSAR
 TITLE: SRA STUDY
 DESCRIPTION: SRA STUDY
 SETUP FILENAME: NRT_OPSSHISPLOTT_SETUP:00SAR
 START/STOP TIME: 02/001/00:00:00.0 - 02/002/00:00:00.0

Y-DATA	CHAN	UNITS	TYPE	VS	X_DATA	Y-DATA	CHAN	UNITS	TYPE	VS	X_DATA	CHAN	UNITS	TYPE	SYM	GPH
NSARTXBT	FA426	DEG	EU	TIME	NSARTXB	FA497	DEG	EU	TIME	NSARTXAT	FA505	DEG	EU	TIME	---	3
NSARALOT	FA394	DEG	EU	TIME	NSARPTCA	FA505	DEG	EU	TIME	NSARALOT	FA490	DEG	EU	TIME	---	4
NSARBLOT	FA402	DEG	EU	TIME	NSARPTBT	FA490	DEG	EU	TIME	NSARBLOT	FA490	DEG	EU	TIME	---	4

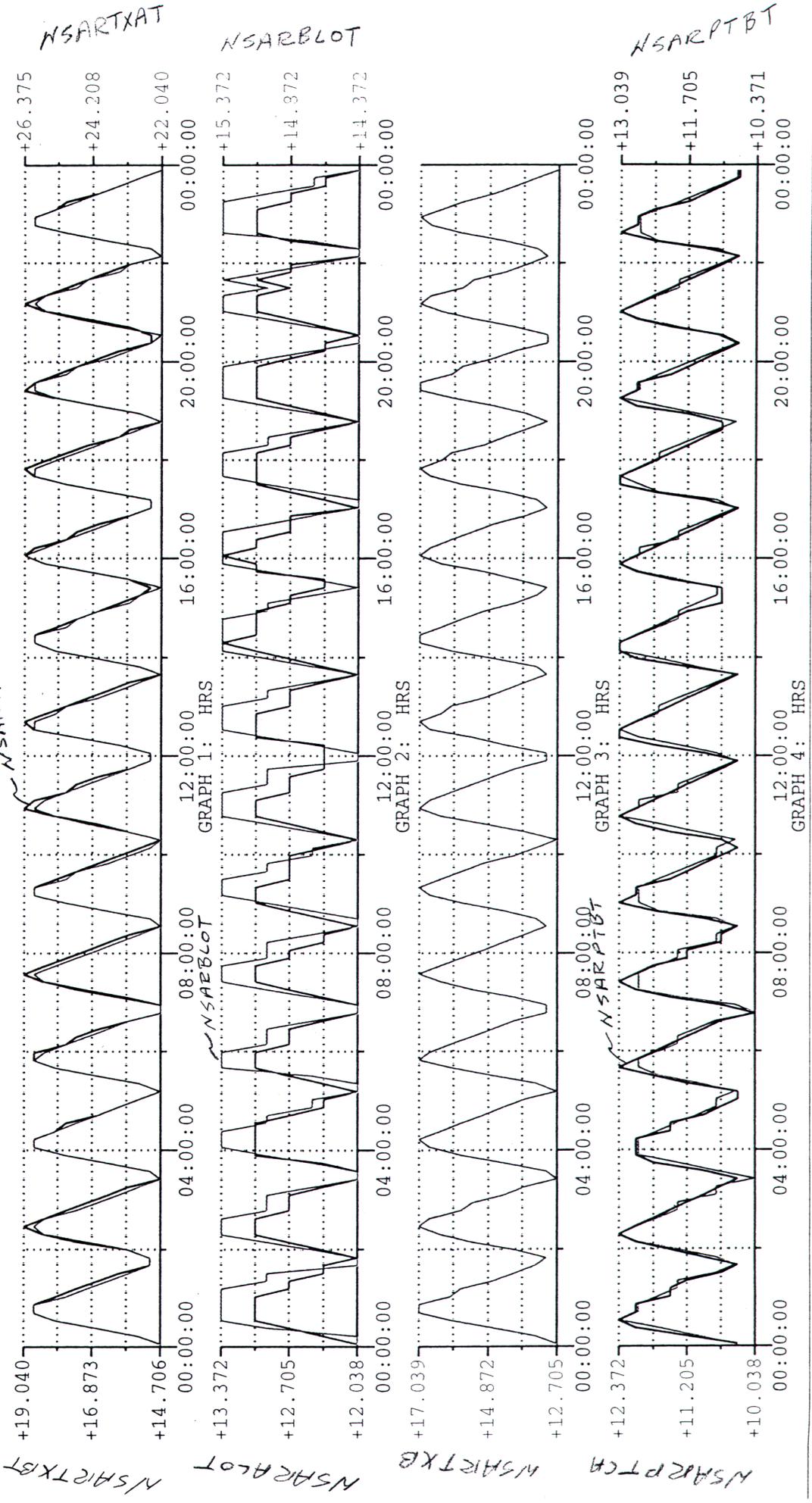


FIGURE - 4 FLIGHT TEMPERATURE OF THE SARR TRANSMITTER & RECEIVER